National Climatic Data Center

DATA DOCUMENTATION

FOR

DATA SET 6211 (DSI-6211)

Rawinsonde 6-second Data

December 9, 2002

National Climatic Data Center
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Asheville, NC 28801-5001 USA

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1. Abstract: High resolution 6-second data have been received at NCDC since April 1995 and archived as TD-9948/DSI-9948. The data are processed by NCDC through a PC/Workstation based Upper-Air Data Assimilation System (UDAS) which creates the final ASCII archive files. The requirement to include the U and V components of the winds has initiated this data set. UCAR/Joint Office of Science Support (JOSS) provided the software to create DSI-6211 from TD-9948 (DSI-9948).

JOSS applied a correction to the Space Data radiosonde relative humidity (RH) calculations. In the resistance and RH calculations, the NWS MicroART sounding system used, instead of the observed temperature, the observed temperature divided by 100. The JOSS applied a correction re-deriving the resistance ratio, using the observed temperature divided by 100 and the observed RH, iterating the so termed "1A" and "1B" coefficients. Now using only the new calculated resistance ratio, the observed temperature and the "1A" coefficients, the new RH was obtained.

JOSS also implemented a correction to the VIZ radiosonde RH calculations. Using the observed temperature and RH, and iterating both the "1A" and "1B" coefficients, the resistance ratio was re-derived. Using the calculated resistance ratio, the observed temperature and only the "1A" coefficients, the new RH was determined.

In both radiosonde types, deriving winds using raw 6-sec resolution elevation and azimuth angle data containing elevation angle oscillations occasionally led to large oscillations in wind velocity, specifically at low elevation angles. The general approach correcting this problem was removing outlier radiosonde position data before computing the wind components. This process required fitting a ninth order polynomial to the azimuth and elevation angle data from 360 seconds to the end of the sounding, then comparing the calculated residuals and observed values, and finally removing the outliers when present.

Applying some additional smoothing helped rectify the more extensive problem occurring when low elevation angles were within 10 degrees of the limiting angles (LA). When the elevation angle was between (LA + 7.5) and (LA + 10), the new elevation angle was computed using a 2 min linear fit. When the elevation angle was between (LA + 5) and (LA + 7.5), the new elevation angle was computed using a 3 min linear fit. When the elevation angle was less than (LA + 5), the new elevation angle was calculated employing a 4 min linear fit. No frequency smoothing occurred when the number of low elevation angle observations was greater than 20% of the total number of observations. A Finite Fourier Series analysis performed using the elevation angle's residuals allowed removal of 90-190 second periods and smoothing periods below 30 seconds.

Obtaining the u and v wind components entailed fitting a 2 min second order polynomial to the position except for the beginning and end minute (or 1.5 minutes if over 50 mb) which used a 3 min fit. A linear fit was used when there were less than 15% of the total number of points, not including the beginning or end of the flight, on one side of the point under going the wind value calculation.

The data records (1 record per 6 second interval including surface) contain 22 fields as follows: 20-character sort key, time from release, pressure, temperature, dew point, relative humidity, U and V wind components, wind speed and direction, ascent rate, balloon position data, altitude, and quality

control flags. Each field is separated by spaces with a total width of 150 characters. The data are right-justified within the fields. All fields, except for the sort key field, have one decimal place of precision with the exception of latitude and longitude, which have three decimal place precision. The contents and sizes of the fields are detailed below. The Aformat@ column represents the FORTRAN representation of the field. The AMissing Flag@ column consists of just enough 9s to fill the field. Note also that there is a space (FORTRAN format 1X) between each field except between field 1 and 2. The 22 fields that appear in each data line are as follows:

Field No.	Width	Format	Parameter	Unit	Missing Flag
1	20	I20	Sort Key	NA	NA
2	6	F6.1	Time	Seconds	9999.0
3	6	F6.1	Pressure	Millibar	9999.0
4	5	F5.1	Dry-bulb Temp	Degrees C	999.0
5	5	F5.1	Dew Point	Degrees C	999.0
6	5	F5.1	Relative Humidity	Percent	999.0
7	6	F6.1	U Wind Component	Meters/Second	9999.0
8	6	F6.1	V Wind Component	Meters/Second	9999.0
9	5	F5.1	Wind Speed	Meters/Second	999.0
10	5	F5.1	Wind Direction	Degrees	999.0
11	5	F5.1	Ascension Rate	Meters/Second	999.0
12	8	F8.3	Longitude	Degrees	9999.0
13	7	F7.3	Latitude	Degrees	999.0
14	5	F5.1	Elevation	Degrees	999.0
15	5	F5.1	Azimuth	Degrees	999.0
16	7	F7.1	Altitude	Meters	99999.0
17	4	F4.1	QC for Pressure	Code (see below)	99.0
18	4	F4.1	QC for Temp	Code (see below)	99.0
19	4	F4.1	QC for Humidity	Code (see below)	99.0
20	4	F4.1	QC for U Component	Code (see below)	99.0
21	4	F4.1	QC for V Component	Code (see below)	99.0
22	4	F4.1	QC for Ascension Rate	Code (see below)	99.0

In the tables below, the first character is a blank in Fields 9-28.

FIELD	1	2	3	4	5	6
ELEMENT	WBAN NUMBER	YEAR	MONTH	DAY	HOUR	RELEASE NUMBER
#CHARAS	XXXXX	XXXX	XX	XX	XX	X
REC POS	001-005	006-009	010-011	012-013	014-015	016-016

FIELD	7	8	9	10	11	12
ELEMENT	SEQUENCE NUMBER	TIME	PRESSURE	TEMP	DEW POINT TEMP	RELATIVE HUMIDITY
#CHARAS	XXXX	XXXX.X	XXXXX.X	XXXX.X	XXXX.X	XXXX.X
REC POS	017-020	021-026	027-033	034-039	040-045	046-051

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FIELD	13	14	15	16	17	18
ELEMENT	U-WIND COMP	V-WIND COMP	WIND SPEED	WIND DIR	ASCN RATE	LONG
#CHARAS	XXXXX.X	XXXXX.X	XXXX.X	XXXX.X	XXXX.X	X---X.X
REC POS	052-058	059-065	066-071	072-077	078-083	084-092

FIELD	19	20	21	22	23	24
ELEMENT	LATITUDE	ELEVATION	AZIMUTH	ALTITUDE	QC PRESSURE	QC TEMP
#CHARAS	XXXXXX.X	XXXX.X	XXXX.X	XXXXXX.X	XXX.X	XXX.X
REC POS	093-100	101-106	107-112	113-120	121-125	126-130

FIELD	25	26	27	28
ELEMENT	QC HUMIDITY	QC U COMP	QC V COMP	QC ASCN RATE
#CHARAS	XXX.X	XXX.X	XXX.X	XXX.X
REC POS	131-135	136-140	141-145	146-150

Fields 17 through 22 contain the JOSS derived Quality Control information. Any QC information from the original sounding is ignored. Currently, field 21 will always be missing. The quality codes used are as follows:

Code	Meaning
99.0	Unchecked (QC information is "missing.") ("UNCHECKED")
1.0	Checked, datum seems physically reasonable. ("GOOD")
2.0	Checked, datum seems questionable on physical basis. ("MAYBE")
3.0	Checked, datum seems to be in error. ("BAD")
4.0	Checked, datum is interpolated. ("ESTIMATED")
9.0	Checked, datum was missing in original file. ("MISSING")

2. Element Names and Definitions:

a. WBAN number: (IWBAN#) an integer, is a number that uniquely specifies fixed surface location at which the data are collected
b. Year: (IYEAR), an integer, is the year in which the data were observed.
c. Month: (IMON), an integer from 1 to 12, is the month in which the data were observed.
d. Day: (IDAY), an integer from 1 to 31, is the day in which the data were observed.
e. Hour: (IHOUR), an integer from 0 to 24, is the hour in which the data were observed.

f. Flight number: (IREL), an integer, is the number of the radiosonde flight. Usually there is only one flight for a particular station and time. However, if problems occur with the first flight, a subsequent flight made be made.
g. Sequence Number: (ISEQ), an integer from 0-9999, the numerical sequence of the records generated from each radiosonde flight. This parameter is used to maintain the same sequence that were archived on diskette should the data be sorted.
h. Time: (TIME) a 6-digit real number that contains the elapsed time in seconds since the release of the sounding.
I. Pressure: (PRESS) a 6-digit real number that contains the atmospheric pressure in millibars at the current level.
j. Dry-bulb Temperature: (TEMP) a 5-digit real number that contains the air temperature in Celsius degrees at the current level.
h. Dew Point Temperature: (DEWPT) a 5-digit real number that contains dew point temperature in Celsius degrees at the current level.
i. Relative Humidity: (RH) a 5-digit real number that contains the relative humidity in percentages at the current level.
j. U Wind Component: (UCMP) a 6-digit real number that contains the U component of the wind in meters per second at the current level.
k. V Wind Component: (VCMP) a 6-digit real number that contains the V component of the wind in meters per second at the current level.
l. Wind Speed: (SPD) a 5-digit real number that contains the speed of the wind in meters per second at the current level.
m. Wind Direction: (DIR) a 5-digit real number that contains the direction of the wind in degrees at the current level.
n. Ascension Rate: (WCMP) a 5-digit real number that contains the ascension rate of the balloon in meters per second at the current level.
o. Longitude: (LON) a 8-digit real number that contains the longitude of the balloon in degrees at the current level. West longitudes are negative (-).
p. Latitude: (LAT) a 7-digit real number that contains the latitude of the balloon in degrees at the current level. South latitudes are negative (-).
q. Elevation: (ELE) a 5-digit real number that contains the elevation angle from the release point of the balloon in degrees.
r. Altitude: (ALT) a 7-digit real number that contains the height in meters of the current level.
s. Quality Code for Pressure: (QP) a 4-digit real number that contains the quality code for pressure.
t. Quality Code for Temperature: (QT) a 4-digit real number that contains the quality code for temperature.
u. Quality Code for Relative Humidity: (QRH) a 4-digit real number that contains the quality code for relative humidity.
v. Quality Code for U Component: (QU) a 4-digit real number that contains the quality code for the U component of the wind.
w. Quality Code for V Component: (QV) a 4-digit real number that contains the quality code for the V component of the wind.
x. Quality Code for Ascension Rate: (QDZ) a 4-digit real number that contains the quality code for the ascension rate of the balloon.

3. Start Date: 19989999

4. Stop Date: Ongoing.

5. Coverage: Contiguous United States, Alaska, Hawaii, Caribbean Islands,

Pacific, and other overseas stations operating in agreement with the NWS.

a. Southernmost Latitude: 14S
b. Northernmost Latitude: 71N
c. Easternmost Longitude: 70W
d. Westernmost Longitude: 171W

6. How to Order Data:

Ask NCDC's Climate Services about the cost of obtaining this data set.
Phone: 828-271-4800
FAX: 828-271-4876
E-mail: NCDC.Orders@noaa.gov

7. Archiving Data Center:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

8. Technical Contact:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

9. Known Uncorrected Problems: None.

10. Quality Statement: This data set under went a two-stage QC process at UCAR with no quality control performed at NCDC. First, an internal consistency check that included two inspections: "reasonable" limit checks on all parameters and rate-of-change checks on temperature, pressure and ascension rate. Secondly, each sounding endured a visual examination verifying those parameters that are too variable for automatic checks: wind speed, wind direction and moisture. In addition, this stage of the QC process allowed verification of the automatic check's QC flags.

11. Essential Companion Datasets: TD9948 (DSI-9948): 6 Second Upper Air Data

12. References:

Micro-ART Observation and Rework Programs Technical Document, National Weather Service, National Oceanic and Atmospheric Administration, Washington, D.C., March 1991.

Williams, S.F., C.G. Wade, and C. Morel, 1993: A comparison of high resolution radiosonde winds: 6-second Micro-ART winds versus 10-second CLASS LORAN winds. Preprints, Eighth Symposium on Meteorological Observations and Instrumentation, Anaheim, California, Amer. Meteor. Soc., 60-65.

Williams, S.F., January 1995: Tactical Data Collection/Management Plan for the 1995 Enhanced Seasonal Observing Period, University Corporation For

Atmospheric Research (UCAR) Joint Office of Science Support (JOSS).

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